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annuity of 40 years. The comparisons are so easy that I do not think it necessary to give more examples. This last theorem will materially assist in judging of the closeness of the approximation, and in making a first attempt at the value of q , when the table of facts is given.

It may be suspected that a value of q derived from a considerable average of short annuities would, when combined with properly altered values of A and g , give a table still nearer to the original than that obtained by Mr. Gompertz's constants, though this last is surprisingly near. Very slight changes in the value of q make differences of years in the *seniority*. The effect of the rate of interest is comparatively small. At 6 per cent., with lives both aged 20, and an annuity for the whole life, the seniority is 18 years; at 3 per cent., 17, as above.

The law of uniform seniority, as it may be called, is true for any given and uniform interval of age. If $y = x + h$, we have

$$z = x + \frac{\log. (1 + q^h)}{\log. q}.$$

On the Mortality amongst American Assured Lives. By SAMUEL BROWN, F.S.S., *Actuary of the Guardian Assurance Company.*

[Read before the Institute of Actuaries, 2nd May, 1859, and ordered by the Council to be printed.]

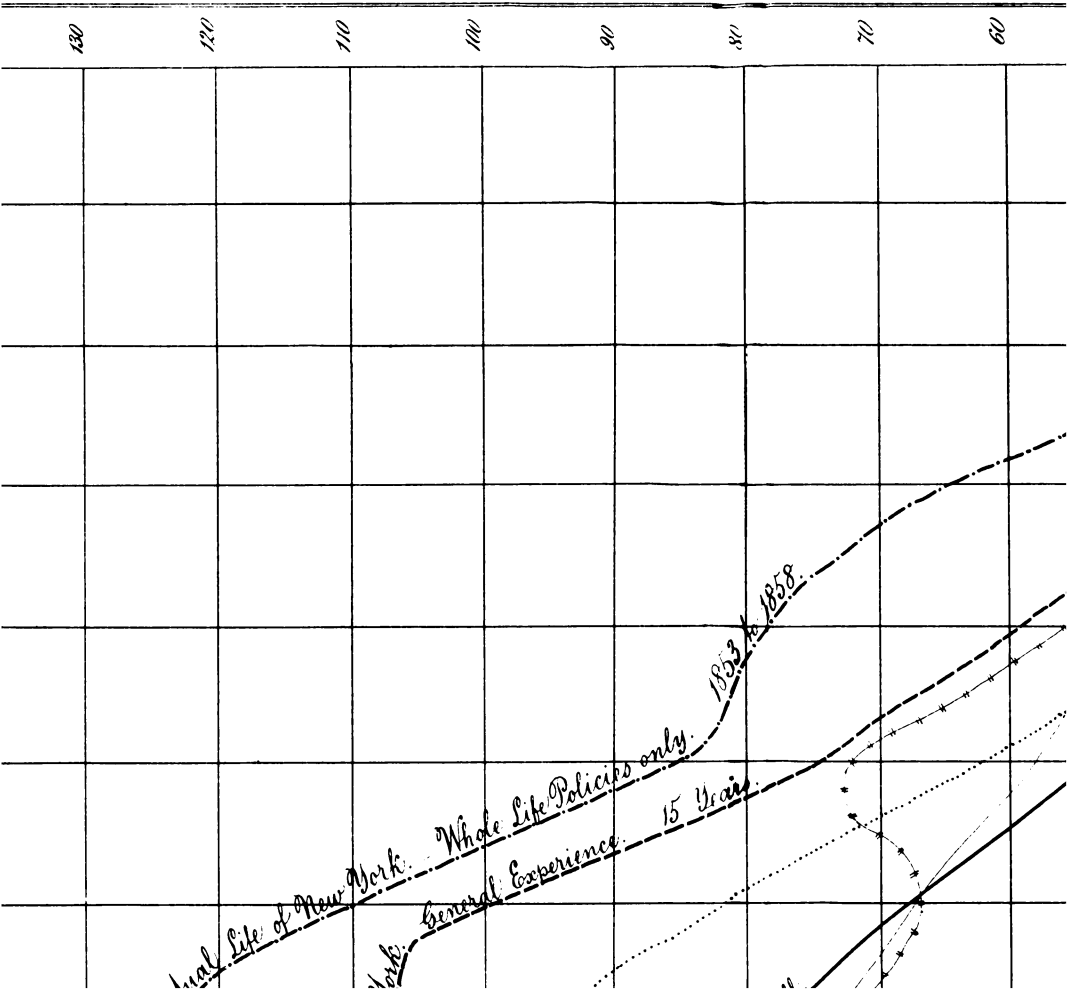
THE extension of life assurance in the United States, and, especially, the more or less successful attempts of English Companies to compete with the American Companies, render an inquiry into the mortality of American assured lives of the greatest interest to the members of this Institute. The question assumes the greater importance, because, from various reasons, the population statistics of the United States have hitherto been, and will for a long period probably continue to be, in a very imperfect state, notwithstanding the talents and skilful labours of the able men to whom the collection of the data in the different censuses has been entrusted, and the readiness of the people to afford the information desired. The marvellous rapidity with which the population has there increased; the vast extent of the country showing such a diversity of soil and climate; the conversion of the country into town districts, or of wild insalubrious localities into lands reclaimed and rendered

*The experience of mortality in the
city of New York, compared with other States.*

. Numbers out of which.

180	170	160	150	140	130

out of which one person will die in a year.



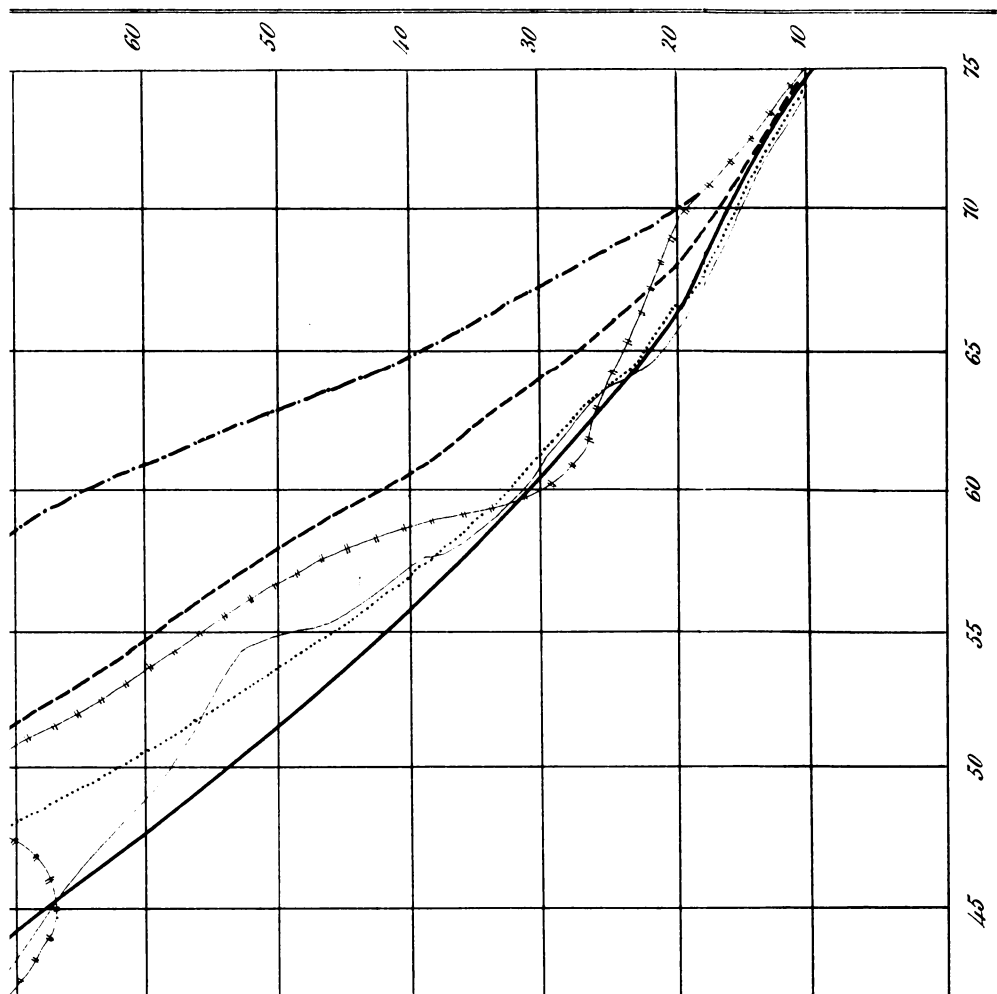
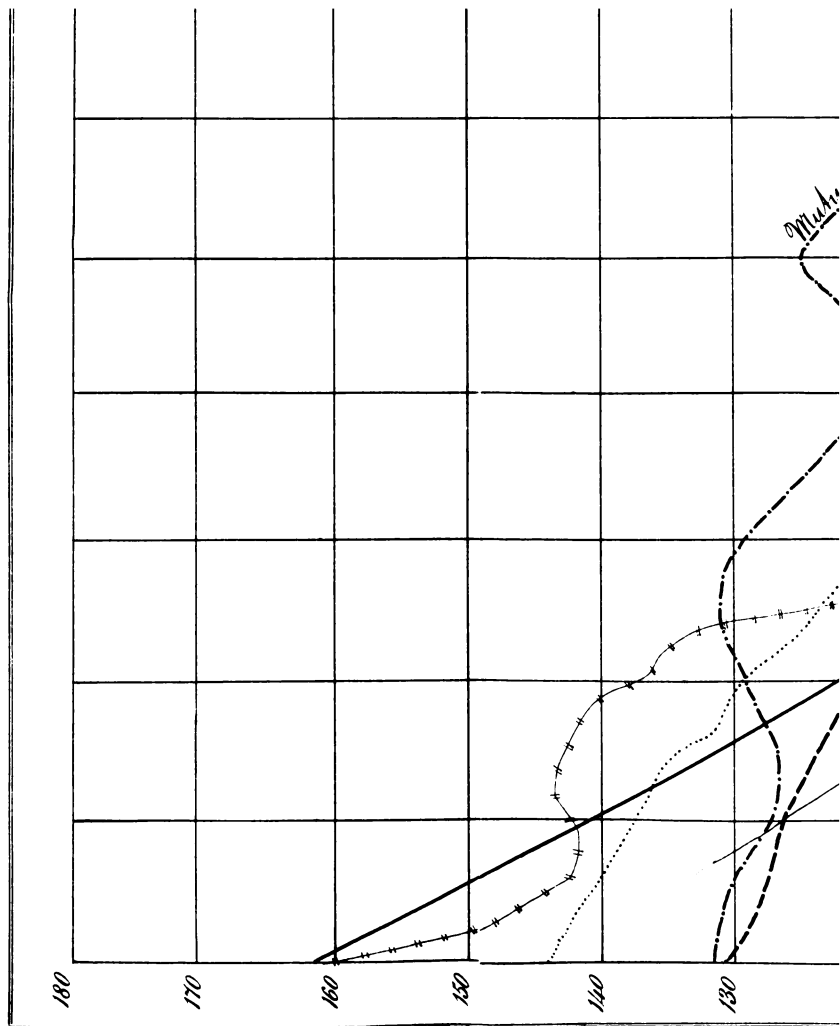
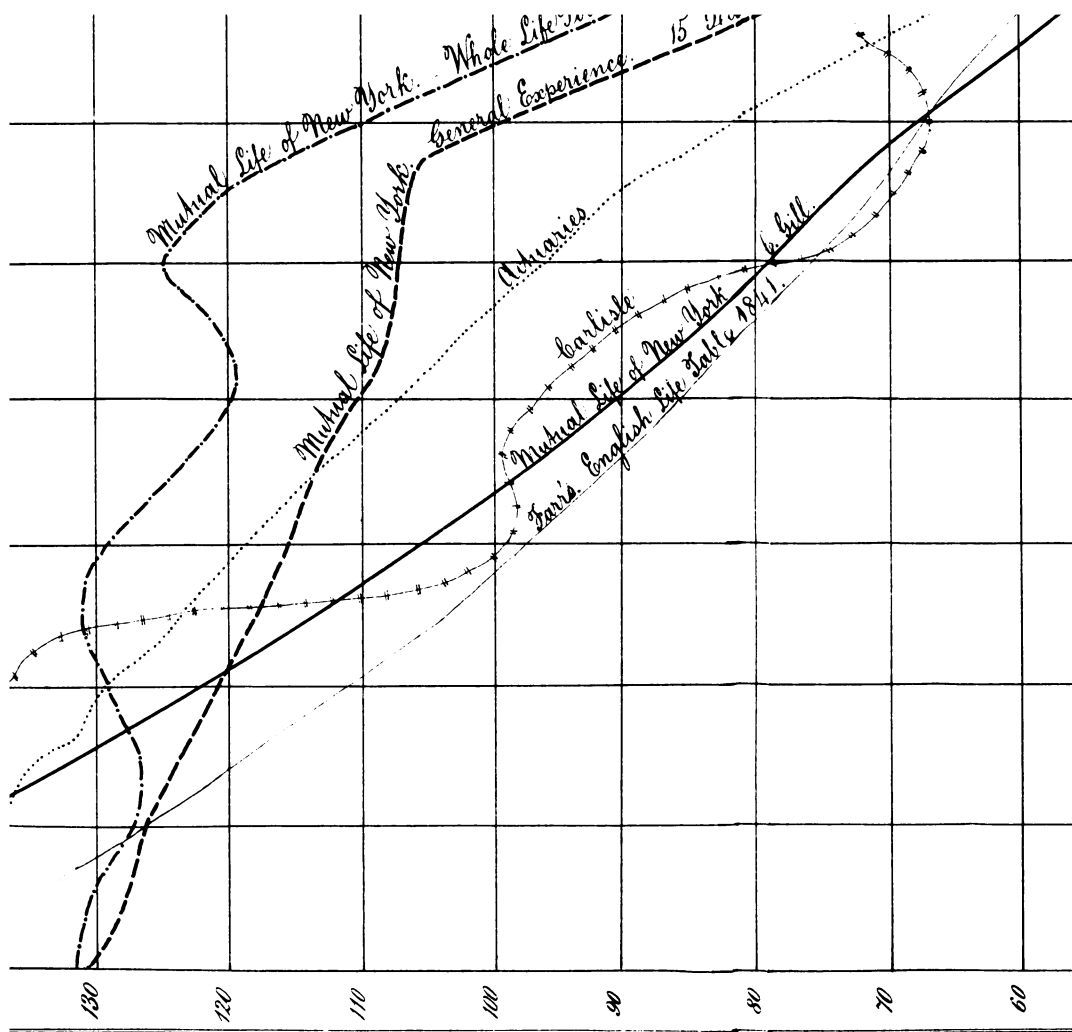


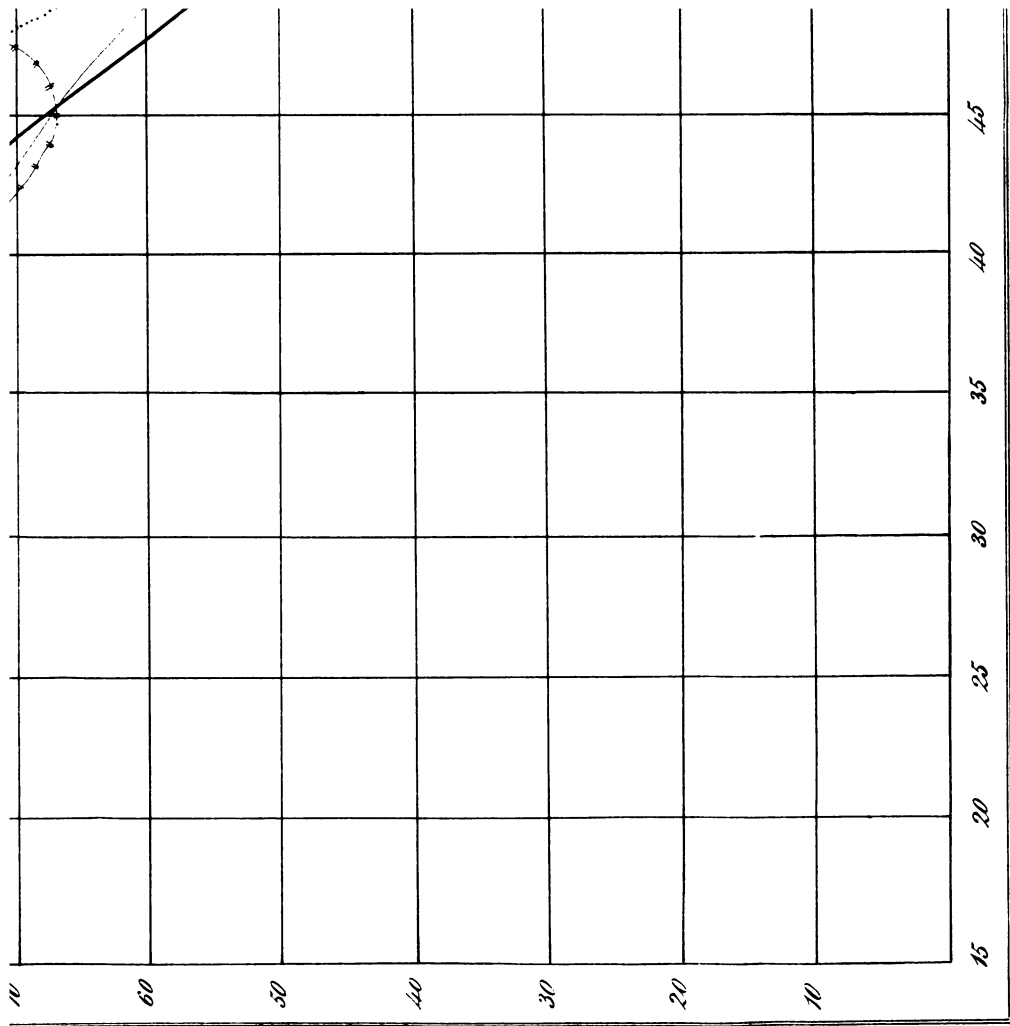
Figure 1.1. Plot of λ vs. μ

708.

Diagram. Showing the exp.
Mutual Life Insurance Company of N.





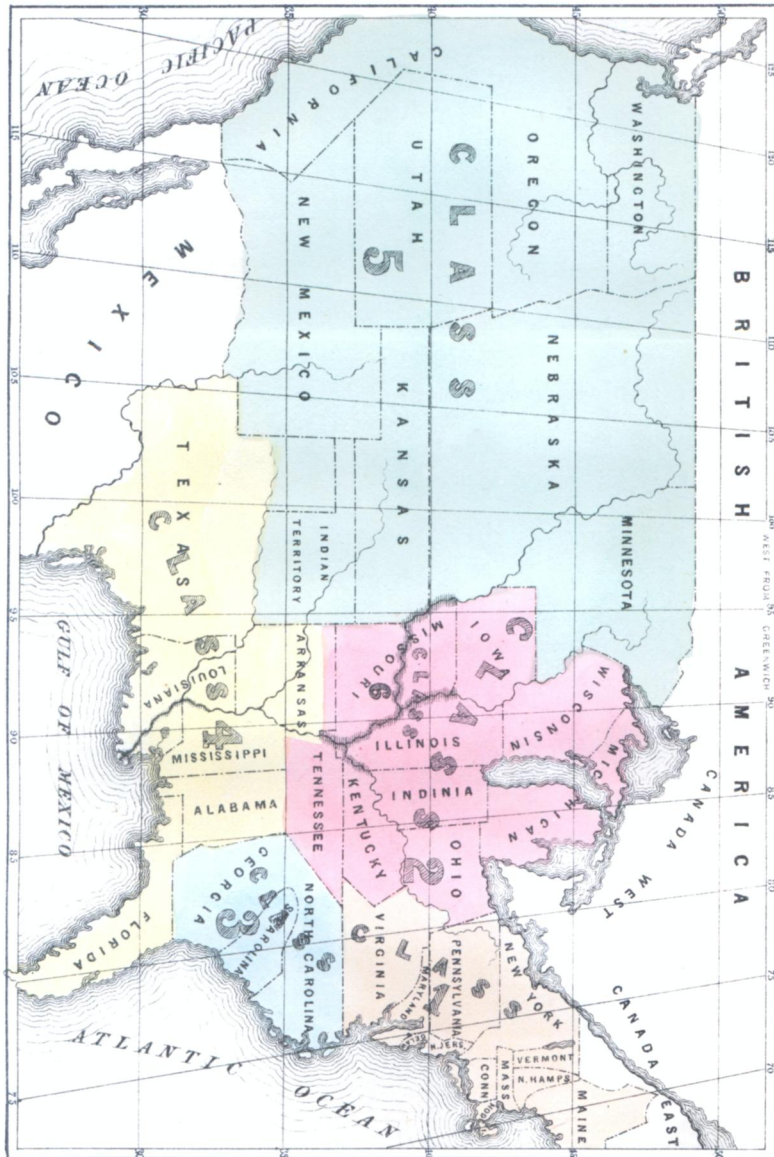


Ages.

CLASS 1.—THE NEW ENGLAND STATES, NEW YORK, PENNSYLVANIA, NEW JERSEY, DELAWARE, MARYLAND, & Part of VIRGINIA.

CLASS 2.—MICHIGAN, WISCONSIN, IOWA, ILLINOIS, INDIANA, OHIO, MISSOURI, KENTUCKY, and Part of ARKANSAS & TENNESSEE.

CLASS 3.—GEORGIA, NORTH & SOUTH CAROLINA, SOUTHERN STATES on the ATLANTIC.



Cartoon: John West N. London

CLASS 4.—TEXAS, MISSISSIPPI, ALABAMA, FLORIDA, LOUISIANA (SOUTHERN STATES on the GULF OF MEXICO).

CLASS 5.—THE WESTERN TERRITORIES, AND CALIFORNIA.

CLASS 6.—THE MISSISSIPPI VALLEY, within 10 Miles of the MISSISSIPPI AND MISSOURI RIVERS north of 36°

CLASS 7.—RISKS in FOREIGN COUNTRIES, SEA RISKS, and all not included in the other Classes

healthy by the industry of a dense population—are all so many obstacles to prevent our obtaining at present any Government statistics that could be relied on for the discussion of this grave question. Another serious difficulty is, not only the tendency of the young and enterprising to move from the States in which they were born, in order to open up new lands and lay the foundations of future States, but the tide of emigration, which, setting in from Europe, and especially from this country, overwhelms all the well-known laws of population which prevail in the old world, and disturbs all the calculations of the most acute political economist. It is easy to perceive that the influx of a large number of immigrants, mostly in the prime of life—some unmarried, though of marriageable age—some recently married, and others bringing with them families of grown-up children of various ages—would materially alter the social status of a people, according to the ages of the immigrants on their arrival, and the early period at which a new generation might be found mingling with the native population. In the census of the United States, taken in 1850, the first attempt was made to distinguish the “native born” from the “foreign” population; and it was found, that amongst the free inhabitants, whilst 17,737,505 were natives of the soil, the large number of 2,210,028 were born in foreign countries. Of this number, Great Britain contributes more than half, as may be seen by the following summary:—

		Per cent.
Natives of Ireland	961,719	43·50
„ Germany	573,225	25·93
„ England	278,675	12·61
„ British America	147,700	6·68
„ Scotland	70,550	3·19
„ France	54,069	2·44
„ Wales	29,868	1·35
„ other countries	95,022	4·30
	<hr/> 2,210,828	<hr/> 100·

Mr. Joseph C. G. Kennedy, who was the superintendent of the census of 1850—and whom many of us have pleasure in recalling to mind as present at the dinner given at Richmond, in 1851, by this Institute, to the representatives of British and foreign assurance interests, and, on behalf of the United States, returning thanks in an able speech—gives, in a *Report on the American Census*, some curious speculations as to the effect of this immigration. From an inspection of the returns at the State Department of the Custom House of New York, and other ports of entry, it appears

that comparatively few of the immigrants are above 45 years of age; that females under that age constitute only two-fifths of the whole number; that the total proportion of immigrants under 15 is 21·8 per cent.; from 15 to 30, 50·6 per cent.; and from 30 to 45 and upwards, 27·6 per cent. From various causes, the mortality of immigrants is greater than that of the land of their birth—which fact is proved alike by the American statistics collected in California, and from the severe ravages of the cholera in America among the “foreign” population. The large proportion of Irish immigrants, too—who are subject to a higher rate of mortality than the general population of England—would affect the results; but, making a deduction of 10 per cent. for these causes, and after allowing for the balance of re-emigration from Canada, it was found, by calculation, that the survivors of immigrants who entered the United States as permanent residents since 1790, would be about equal to the number above given as found existing by the census of 1850. How great a variation, having reference to the ages above stated, such an immigration would create in the law of population of the country at the last census, may be estimated from the fact, that the arrivals of foreign passengers in the ports of the United States amounted to no less than a million and a half in the ten years preceding 1850.

To this disturbing element must be added the roving tendency of the existing population to quit the States of their birth and migrate and settle in other States. Out of 17,736,792 free inhabitants, no less a number than 4,112,433 are recorded as being natives of other States; 26 per cent. of all the natives of Virginia, 36 per cent. of the natives of South Carolina, and 31 per cent. of the free inhabitants of North Carolina, were found beyond their own borders; and amongst the Northern States Vermont and Connecticut had sent out 25 per cent. of their native inhabitants to settle in other States.

It is evident, therefore, that until the taking of the census just quoted, no reliable data existed for computing life tables or furnishing even approximate materials for determining the true law of mortality in the various States of America. Two tables were, however, formed from the observations of the census of 1850, under the authority of Mr. Kennedy, for Massachusetts and Maryland; and a more recent one for Massachusetts, by Mr. E. B. Elliot, was published in the *Proceedings of the American Association for the Advancement of Science, held at Montreal in August, 1857.*

With regard to the former, it may be observed that the records of mortality only extend over the census year; and though it is considered to have been an average year for deaths, yet the assumption that the population, affected by so many causes of irregular movement, is to be taken as stationary, is one that greatly depreciates the value of any tables deduced therefrom. The rate of mortality observed over the whole of the States is so much less than that in any large part of Europe, that the statements must be received with some degree of allowance, especially as the deaths to the living in 1850 varied from 1 in 43 in Louisiana to 1 in 233 in Oregon. Still, the mortality of Maryland, comprising a population of 583,034, and showing a death-rate of 1·685 per cent., is considered by Mr. Kennedy to be a fair estimate of the standard of human life in the older settled States; and it is remarkable, that as to male life, it differs but little from Farr's English Life Table for 1841, whilst for female life it gives an expectation of from $1\frac{1}{2}$ to 2 years above the English Table. Another table was formed from the returns for Massachusetts for males and females separately. The following comparison of the expectation of life shows to what extent the American rate of mortality in the settled States corresponds with our own.

Expectation of Life.

Ages.	MASSACHUSETTS CENSUS, 1850.		MARYLAND CENSUS, 1850.		ENGLAND CENSUS, 1841.	
	Males.	Females.	Males.	Females.	Males.	Females.
0	38·3	40·5	41·8	44·9	40·2	42·2
20	40·1	40·2	39·7	42·1	39·9	40·8
40	27·9	29·8	25·8	29·5	26·6	27·7
60	15·6	17·	14·4	16·	13·6	14·4
80	5·9	6·4	6·2	7·	4·9	5·2

Mr. Kennedy's Report on the Census, from which the above statement is taken, was made 1st December, 1852; but since then, viz., 1st September, 1854, a very admirable statistical view of the United States, embracing their territory, population,—white, free, coloured, and slave,—moral and social condition, industry, property, and revenue—the detailed statistics of cities, towns, and counties,—being a compendium of the seventh census in 1850, and comparisons with the previous decennial censuses from 1790,—was presented to the Secretary of the Interior by Mr. J. B. D. De Bow, the then superintendent of the census. It was compiled in ac-

cordance with a resolution of the Senate, dated 12th July, 1854, and 50,000 copies were ordered to be printed. It gives a most complete abstract of the various matters comprised in the last census, and furnishes a table of the deaths in the census year at decennial periods of age for each separate State, which, compared with the living, would enable a life table to be formed for every State, provided the broad assumption that the population is stationary could be admitted. Mr. De Bow suggests, also, that the statistics of manufactures and mortality, which alone remain of the census, could be published in the same form, if ordered by the Senate, and would be ready by the following meeting of Congress. I am not aware, however, whether this proposed continuation was agreed to.

It is evident, from the preceding statements, that in carrying out the business of life assurance, the American Companies had no reliable statistics of their own, and were obliged to have recourse to the life tables already in use in the Old World. Accordingly, I find it stated in the Reports of one of the Companies, that the table in use was that generally adopted by the Life Assurance Companies of the United States, which was based on the Carlisle 4 per cent., with about 35 per cent. addition thereto. The Companies were sufficiently protected at early periods of their history, and even now, by the high rate of interest which has been obtained even on first-class securities. In the Mutual Life Assurance Company of New York, to which I shall have occasion to revert presently, the loans are stated to amount to 4,294,593 dollars, and are all bearing interest at 7 per cent. per annum; and the finance committee report, that, with a single exception,—in which the loss, if any, cannot be large,—no loan is known to be in jeopardy through the insufficiency of the security. This is one of the most prosperous and cautiously-conducted Companies in the States. The leading Companies, however, have been vigilantly watching to avail themselves of any data, either furnished by the State or supplied by their own experience, to prove the safety or correctness of the tables they used; and the life table which I have before alluded to as formed by Mr. Elliott to show the law of mortality in Massachusetts, is stated to be part of an original series which had been prepared for the New England Mutual Insurance Company of Boston, from extensive and reliable European and American data. It was calculated from official abstracts for 1855 of the movements of population in 166 of the 331 towns of the commonwealth of Massachusetts, in each of which the ratio of deaths to population

was more than 1 to 63, their aggregate population being two thirds of the entire State. On the 1st June, 1855, the total population was taken at 751,241, and the deaths during the year 16,086. The mortality represented was probably somewhat lower, through omissions in the registration, than what actually occurred; but as the observations extend over a large proportion of the more populous districts, it is concluded that the law of mortality does not differ much from that of the whole State, and that the errors will balance each other.

The *Fourteenth Annual Report*—relating to the registry and the returns of births, marriages, and deaths in Massachusetts for 1855—and the *Abstract of the Census of the Commonwealth, taken on the 1st June, 1855*, prepared under the direction of the Hon. Francis De Witt, Secretary of the Commonwealth, and under the supervision of Dr. Nathaniel B. Shurtleff, of Boston, appear to be the first and only official Reports, whether State or national, in which the ages of the persons living or dying in the State have been distinguished by towns. In previous Reports, the distinction was by counties; and it is unfortunate that, in the census of that year, the enumeration was not made of the ages of each sex, though a very near approximation may be obtained by dividing the numbers of the sexes in the proportions indicated in the census of 1850. These observations form the foundation of the life table which Mr. Elliott recommends for life assurance purposes.

The table which has been employed by the courts of the Commonwealth in determining the value of life interests in estates, legacies, and pensions, and of reversions in heritable property, is one that was prepared by Dr. Edward Wigglesworth, from bills of mortality previous to 1789, in the States of Massachusetts and New Hampshire, and which was published in the second volume of the *Memoirs of the American Academy of Arts and Sciences*. The most serious defect in its constitution was, that no allowance was made for the rapid increase of the population then going on.

From 1850 to 1855 the population of Massachusetts has increased more rapidly than that of most countries of Europe; the annual rate of increase in that time was 2·63 per cent. After correcting the original returns for increase on account of migration, an adjusted table is produced, of which it will suffice for our present purpose to show the following comparisons with the Carlisle Table :—

Age.	NUMBER LIVING.		EXPECTATION OF LIFE.	
	Massachussets.	Carlisle.	Massachussets.	Carlisle.
0	10,000	10,000	39·8	38·7
5	7,146	6,797	50·2	51·3
10	6,873	6,460	47·1	48·8
15	6,726	6,300	43·	45·
20	6,437	6,090	39·9	41·5
30	5,748	5,642	34·	34·3
40	5,078	5,075	27·9	27·6
50	4,409	4,397	21·3	21·1
60	3,597	3,643	15·	14·3
70	2,475	2,401	9·4	9·2
80	1,059	953	5·	5·5
90	118	142	2·9	3·3
100	2	9

It appears that, from about age 5 to age 15, lower rates of mortality prevailed in Massachussets than is generally the case in European communities; that from age 15 to various ages between 35 and 50, the Massachussets rates are much higher than, after which they again fall somewhat below, the European rates. Under the age of 5 years, the mortality in Massachussets seems more intense than in Europe generally: from 3 to 15 it approaches closely to that of Sweden; from 17 to 45, nearer to Belgium, though higher; and after 45, nearer to, but lower than, the average English rates. As a whole, the mortality of Massachussets is better represented by that of England than of any other European State.

If the mortality in the New England Mutual Life Insurance Company, for which these tables were originally prepared, may be judged from the proportion of losses to sums at risk, it must be considered to present a highly favourable view of American assured lives; for during the last year (the Society having been established in 1844), the claims were only 87,300 dollars on assurances in force of 10,410,300 dollars, being only ·84 per cent. This rate, which is about the average of the last four years, corresponds only to the ages 15 to 20 in the Massachussets table.

Such is a description of the principal tables intended to represent the general law of mortality in the United States, any striking deviation from which would materially affect the prosperity or safety of the Assurance Companies. We now come to the consideration of how far it has been proved correct, or to what extent it differs from the experience of the Companies themselves.

The directors of the Mutual Benefit Life Insurance Company of Newark, New Jersey, have, with a laudable desire to promote

the real interests of life insurance, published, in their prospectus for 1858, the Company's experience for the 12 years of its existence. They profess their intention to continue the publication from time to time, and at another period to go more into detail, giving a classification of the places and general causes of death; and it would be very gratifying to find that the call which they make to other Companies to follow so honourable an example will be responded to. No good can ever come of the concealment of facts, which, if they tend to place the business of life assurance on a safer footing, must be a permanent advantage to the public, and which would prove the most effectual means of protecting the assured themselves from the ignorance of unskilful or the tricks of designing men. I should be glad to see in this country the noble example which a few leading Companies have set, in publishing their experience, more generally followed.

In the Mutual Benefit of New Jersey, a licence is required of the members to go on the seas or to pass beyond the settled limits of the United States, Canada, Nova Scotia, and New Brunswick; nor can they, between the 1st of July and 1st of November, without the consent of the Company, pass south of the southern line of North Carolina and Tennessee, or west of the Mississippi river, except in the settled regions of Iowa, Missouri, Kansas, Nebraska, and Minnesota, north of the 38th degree of latitude, and east of the 100th degree of west longitude. Permission is given to go, by any of the regular line of steamers or first-class sailing vessels, to Europe or to any of the American Atlantic ports north of the Capes of Florida, provided that the Company would assure residents at such ports at the tabular rates of premium.

The experience of the Company, as regards the mortality of the members, is worthy of observation, as the number of members has constantly been, on an average, 4,000, and in latter years 5,000. Lives have been carefully distinguished from policies: and attention has been given to ascertain with accuracy—(1) the number of persons who, at each age of life, took or renewed a policy by payment of the premium; (2) how many died within the year the policy had to run. Each age, therefore, includes new or recent selections, as well as those of earlier date, added together in each successive year of the Company's existence. The experience hitherto has been highly favourable, but the directors very properly add the caution to consider this fact in relation to the benefit of recent medical examination. In the 12 years from 1845 to 1856 are included 49,682 years of life, and 566 deaths. The proportionate

mortality amongst the members, computed for each year, would have been 646 by the Carlisle Table, and 602 by the experience of the seventeen London Offices. I here subjoin the Table of Experience, reserving its comparison with the more important data furnished by the Mutual Life Insurance Company of New York.

Experience of the Mutual Benefit Life Insurance Company, New York.

Age.	Persons Living.	Died.	PROBABLE DEATHS.		Age.	Persons Living.	Died.	PROBABLE DEATHS.	
			Carlisle.	Exp. of London Comp.				Carlisle.	Exp. of London Comp.
14	13	..	·1	·1	48	1,178	16	16·4	16·8
15	22	..	·1	·2	49	1,061	16	14·5	16·
16	42	1	·3	·3	50	961	16	12·9	15·3
17	47	..	·3	·3	51	848	11	12·1	14·3
18	66	1	·5	·5	52	771	6	11·7	13·8
19	87	2	·6	·6	53	706	13	11·4	13·5
20	112	2	·8	·8	54	623	13	10·5	12·7
21	188	4	1·3	1·4	55	547	3	9·8	11·9
22	288	3	2·	2·2	56	491	11	9·3	11·4
23	401	7	2·8	3·	57	404	6	8·4	10·
24	543	4	3·9	4·2	58	356	9	8·6	9·4
25	672	4	4·9	5·2	59	288	6	8·1	8·1
26	799	11	5·9	6·3	60	239	7	8·	7·3
27	970	14	7·5	7·8	61	206	8	7·4	6·7
28	1,154	15	10·	9·4	62	163	4	6·1	5·7
29	1,288	12	12·7	10·7	63	144	1	5·5	5·4
30	1,480	10	15·	12·5	64	128	..	5·1	5·2
31	1,627	14	16·6	14·	65	101	4	4·2	4·5
32	1,794	16	18·2	15·7	66	88	4	3·7	4·2
33	1,968	15	19·8	17·6	67	72	5	3·2	3·7
34	2,027	22	20·6	18·4	68	52	3	2·4	2·9
35	2,110	23	21·6	19·6	69	37	..	1·8	2·2
36	2,194	25	23·1	20·8	70	32	2	1·7	2·1
37	2,216	20	24·1	21·5	71	27	2	1·6	1·9
38	2,211	20	24·7	21·9	72	23	2	1·6	1·7
39	2,115	23	25·1	21·4	73	9	..	·7	·7
40	2,102	12	27·3	21·8	74	5	..	·5	·4
41	1,990	24	27·4	21·1	75	3	..	·3	·3
42	1,869	12	26·9	20·4	76	2	..	·2	·2
43	1,765	26	25·7	19·9	77	2	..	·2	·2
44	1,674	18	24·8	19·6	78	1	..	·1	·1
45	1,571	14	23·3	19·2	79	1	..	·1	·1
46	1,415	9	21·	18·2					
47	1,293	15	18·9	17·5					
						49,682	566	645·9	602·8

As a contribution to the statistics of life assurance, and promise of what is to come, this table deserves attention; but the Report exhibiting the experience of the Mutual Life Insurance Company of New York, though only for 15 years, comprises numerous facts of more varied interest and importance. It extends to February 1st, 1858, and was printed by order of the Board of Trustees. It is prefaced by a letter of the President, F. S. Win-

ston, Esq., to the Board of Trustees, in which he briefly recapitulates the circumstances under which it was prepared—paying a just compliment to the talents and scientific knowledge of Professor Gill, their former actuary, and to the great ability which Mr. Sheppard Homans, their present actuary, has shown in treating of the important questions suggested by the experience of the Company—and touches, with a thorough acquaintance with the subject, on the value of such contributions to science, and the effects they produce. On assuming his official duties, he had applied to other Companies to unite with this Society in gathering from public sources, from local agents and examining physicians in different sections of the country, such facts as might be useful to all; but he regretted to find that no response was made to this appeal, and that the *Report on Vital Statistics*, which was presented to their Board of Trustees by Dr. Wynne, was from data exclusively collected and furnished by their own Company. During the past two years, a further attempt to obtain the experience of other Companies with special reference to “term policies” has also failed. With these facts stated, we cannot but applaud the liberality and public spirit of the trustees in publishing data collected at so much cost and labour, and which will benefit those who have contributed nothing in return. The previous Reports on the mortality observed in the Company comprised the first 10 years of its history, and were brought down to the date of their second declaration of bonus, on the 1st of February, 1853, by Professor Gill, who was a Fellow of this Institute, and visited this country with the view of becoming acquainted with the members of our profession, and gathering practical information as to the state of the science and practice of the business here. His Reports were the first attempts made in the United States to ascertain the effects of climate in the different regions of that vast country. They will be found at length in vol. iii., p. 300, of the *Assurance Magazine*, and I will therefore only briefly recapitulate his conclusions as they bear upon the more complete and recent Report of Mr. Sheppard Homans. The whole of the members of the Company were divided into five classes, according to their residence in localities more or less healthy. In Classes I. and II., comprising the eastern and middle States, and west of the middle States north of the southern line of Virginia and Kentucky, he recommended no increase of premium, as Class II., though up to that time showing a mortality somewhat in excess, was favoured by causes likely to ameliorate it. In Class III., which comprised the States south of the preceding

line and north of the 32nd parallel of latitude, which was charged $\frac{1}{4}$ per cent. extra, his calculations showed that $\frac{3}{4}$ per cent. extra on the sum assured would be required to meet the real risk. The mortality in Class IV., including the States south of the 32nd parallel of latitude, showed a mortality of more than 50 per cent. greater than Classes I. and II.; and whereas they were then charged $\frac{1}{2}$ per cent. extra, the real rate ought to be $1\frac{1}{2}$ per cent. But in Class V., which included the then unsettled districts of California, the mortality had been so excessive—four and a half times greater than that of Classes I. and II., and requiring an extra premium of 13 per cent.—that he could only come to the resolution of advising that risks should not be undertaken there at all. Another remarkable circumstance observed, was, the excessive mortality at the older ages of the general experience of the Company. Whereas, between ages 35 and 55, the mortality in Classes I. and II. was even less than in the first year of the English “Experience of seventeen Offices,” between 35 and 65, it was nearly to their whole experience, and above 65, nearly twice as great. Suspecting that the marked change in the rate of mortality, which occurs in Europe at or about the age of 55, may proceed from some hidden causes which act with still greater intensity in the United States, Professor Gill suggested that at the next State census particular attention should be paid to this point, with the view of eliciting, if possible, the secret of the increase. In the meantime, he advised that no lives should be assured above 55.

The second Report of Professor Gill brought the preceding accounts down to the termination of 10 years’ experience and the period of the second division of profits of the Company. It indicated a general improvement in all the classes except Class IV., and a very perceptible change for the better in Class V.

Mr. Homans’ continuation of these valuable Reports is marked by great scientific skill and ability, and by a thorough knowledge of the theory of life tables and of the points that will occur in the practice of life assurance. His Report is illustrated by diagrams and comparisons with European tables, and is in every way honourable to himself and to the Company with which he is connected. The members of the Company are still divided into the same classes as in the earlier Reports, according to the character of the climate of the States in which they reside; and the observations have been further distinguished into the mortality exhibited by short period policies, and according to the ages in each class. The age taken is the Office age, which (different from the practice which prevails

here of taking the age always as at last birthday) is charged for according to the rate of the nearest birthday, last or next. The Office age, therefore, on the average, very nearly corresponds to the true age at the date of admission. The lives have been carefully separated from the policies, so that every precaution appears to have been taken to ensure accuracy of results, and the probable and actual losses on the sums assured have been compared. The total from 1842 to 1857 shows 68,618 lives as passing through one year, at different ages; the amount assured on which, estimated as for one year, was 211,059,018 dollars, or about £2,814,120 sterling for each year of the Company's existence. The actual losses were 750 lives assured for 2,312,545 dollars, whilst the probable loss by their own Office table would be 914 lives for 2,882,633 dollars, and, by the Carlisle Table, 857 lives for 2,692,464 dollars. This statement comprises, of course, all the worst as well as the best climates—California as well as New England; and it is remarkable that, under such circumstances, the result of 15 years' experience should show claims to the extent of only 80 per cent. of their assumed table, or 90 per cent. of what would be estimated as probable by the Carlisle Table.

The summary for each year is given, but as we have rather to deal with the *law of mortality* amongst assured lives, I pass on to the table which Mr. Homans has given of the number of lives exposed to risk at each age, and the mortality observed therein. The following is a record of the actual facts, and the estimated mortality by the Carlisle Table, which I prefer, for comparison, to the Company's own theoretical table, as being better known in this country. I have also omitted the comparison of losses on sums assured, as being more of special than public interest, and depending to a certain extent on the nature and regulations of the business. (*See Table, next page.*)

Before proceeding to the examination of the table, it will be advisable to describe the classes in which the members have been arranged, and afterwards compare all the results together. The different States combined in each class are indicated in a map which accompanies the *Fifteenth Annual Report of 1858*.

Class I. comprises the New England States, New York, Pennsylvania, New Jersey, Delaware, Maryland, and part of Virginia.

Class II.—Michigan, Wisconsin, Iowa, Illinois, Indiana, Ohio, Missouri, Kentucky, and part of Arkansas and Tennessee.

The best experience of the Company has been in the city of New York, where the lives proposed have passed the examination

Table showing the Actual Mortality by the Experience of the Mutual Life Insurance Company of New York, for Fifteen Years, compared with the Probable Mortality by the Carlisle Table.

Age.	Lives exposed to Risk.	Actual Deaths.	Probable Deaths by Carlisle Table.	Age.	Lives exposed to Risk.	Actual Deaths.	Probable Deaths by Carlisle Table.
14	22	..	·1	47	1,695	20	24·8
15	39	..	·2	48	1,535	23	21·4
16	42	..	·3	49	1,405	18	19·2
17	55	..	·4	50	1,243	15	16·7
18	62	..	·4	51	1,090	17	15·6
19	109	4	·8	52	949	12	14·4
20	173	1	1·2	53	823	15	13·3
21	272	4	1·8	54	727	16	12·3
22	396	5	2·8	55	622	12	11·1
23	597	4	4·2	56	543	13	10·3
24	806	10	5·7	57	448	9	9·4
25	1,046	11	7·7	58	371	6	9·0
26	1,290	11	9·5	59	312	3	8·7
27	1,590	8	12·4	60	259	7	8·7
28	1,878	11	16·3	61	213	12	7·6
29	2,069	20	20·3	62	167	5	6·3
30	2,313	26	23·4	63	132	9	5·0
31	2,503	21	25·5	64	105	5	4·2
32	2,701	31	27·4	65	86	5	3·5
33	2,812	26	28·3	66	67	3	2·9
34	2,995	35	30·4	67	50	1	2·2
35	3,021	29	31·0	68	35	1	1·6
36	3,050	35	32·1	69	27	1	1·3
37	3,068	23	33·2	70	20	1	1·0
38	3,050	30	34·1	71	13	..	·7
39	2,968	31	35·2	72	12	1	·8
40	2,843	13	37·1	73	7	..	·5
41	2,687	21	37·0	74	7	1	·6
42	2,551	21	36·7	75	4	..	·4
43	2,408	28	35·1	76	4	..	·4
44	2,255	23	33·4	77	3	..	·3
45	2,078	21	30·8	78	1	1	·2
46	1,899	15	28·1				
					68,618	750	857·3

of their own medical officers, and the next best in the territory embraced by this and the New England States. The experience of the remaining part of Class I., and the whole of the States comprised in Class II., have been quite similar in the proportion of losses. No extra premiums are charged for these two classes.

Class III.—Georgia, North and South Carolina, or southern States bordering on the Atlantic. The mortality has diminished in the last five years, and has resulted favourably for the Company with the increased extra rates charged since 1854.

Class IV.—Texas, Mississippi, Alabama, Florida, Louisiana, or southern States bordering on the Gulf of Mexico. The mortality has materially increased in the last five years, and to an extent

somewhat alarming. The extra rate charged for the first 10 years was found to be inadequate, and in 1854 it was advanced from $\frac{1}{2}$ to 2 per cent., and on unacclimated risks from 2 to 5 per cent. extra. The present rates are not supposed to be too heavy; and as other Companies still maintain the old rates, they do but little business in this class.

Class V.—The western territories and California. The rate of mortality here has shown a great improvement—no doubt, arising from the increased facilities in procuring the comforts and necessities of life in that newly-settled country. The climate is believed to be excellent; and though the first 10 years of the Company showed a heavy loss (the actual deaths being 419 to every 100 predicted), yet the last five have scarcely exceeded the mortality expected, and a hope is expressed that the time may soon come when the extra rate will bear reduction.

Class VI.—The Mississippi Valley, within 10 miles of the Mississippi and Missouri rivers, north of 36 degrees. This class has been recently formed out of Class II., and comprises only the immediate vicinity of these rivers, where a charge of $\frac{1}{4}$ per cent. extra, believed to be sufficient, is made.

Class VII. embraces risks in various foreign countries, but principally sea risks in the naval and merchant services. Since taking off the extra rate charged for sea risks between America and Europe, several losses have occurred amongst the assured who were on board steamers or sailing vessels, and it is doubtful whether it was expedient to take off the extra risk formerly required in these cases.

Considering that the assured reside in all parts of the United States, under such varied conditions of climate and manner of life, the following table, showing the actual and probable mortality in each class—the first ten compared with the last five years of the Company's experience—becomes of great interest. (*See next page.*)

In addition to the observations before made on the nature of this table, it is worthy of remark, that in Class IV., in which the proportion of actual to predicted deaths has greatly increased in the last five years, the proportion of money loss has been even greater still—208,500 dollars having been paid where only 119,209 dollars were expected as claims. It seems to me to demand an inquiry into the motives for assurance as well as into the risks of climate.

		Lives exposed to Risk for a whole Year.	Deaths.	Actual Mortality per Cent.	Probable Mortality per Cent.	Percentage of Actual on Probable Deaths.	Actual Money Loss to every 100 dollars predicted.
Whole Company.	{ 1843-52	31,432	340	1·08	1·28	84·8	77·7
	{ 1853-57	37,186	410	1·10	1·33	79·9	82·1
	{ 15 years	68,618	750	1·09	1·33	82·	80·2
Class I.	{ 1843-52	19,937	178	·89	1·28	69·8	69·9
	{ 1853-57	26,640	262	·98	1·39	71·1	
	{ 15 years	46,577	440	·96	1·34	70·5	
Class II. (inc. VI.)	{ 1843-52	4,479	48	1·07	1·26	84·7	87·2
	{ 1853-57	6,394	79	1·23	1·33	92·9	
	{ 15 years	10,873	127	1·17	1·30	89·7	
Class III.	{ 1843-52	1,570	20	1·27	1·29	99·	98·9
	{ 1853-57	1,555	21	1·35	1·46	92·6	
	{ 15 years	3,125	41	1·31	1·37	95·6	
Class IV.	{ 1843-52	1,441	23	1·24	1·29	123·8	174·9
	{ 1853-57	1,638	35	2·14	1·46	146·2	
	{ 15 years	3,079	58	1·88	1·38	136·4	
Class V. (inc. VII.)	{ 1843-52	861	37	4·30	1·03	418·7	69·4
	{ 1853-57	960	13	1·35	1·34	101·2	
	{ 15 years	1,821	50	2·75	1·19	230·6	

In order to show in a very clear way the practical use of this table to the Company, Mr. Homans has calculated the rate of extra premium per cent. on the amount of assurance which ought to be demanded in order to place the members of the different classes on the same footing as Class I., or Classes I. and II. combined.

	With Class I.	With Classes I. and II. combined.	Extra Premium now charged per Cent. on Sum Assured.
Class II.	0·745
" III.	1·147	0·975	0·5
" IV.	2·867	2·634	2·0
" V.	5·449	5·158	1·0
Ditto, from 1853.	1·290	1·092	1·0

Several applications have been made from the southern agencies to have the extra premiums reduced; but it is evident, from the above results, that they have been judiciously laid on, that in no case do they equal the actual extra risks incurred, and that, in justice to the large majority of members who reside in the New England and Middle States, they can neither be rescinded nor reduced.

The next interesting question is as to the relative mortality amongst persons assured for short periods or the whole of life; and

the last Report suggested that the issue of term policies at the rates hitherto charged is not advisable, as the mortality greatly exceeds that deemed probable by their own tables, or by the tables of English Companies. The attempt to combine the experience of other American Companies in this respect failed, but the following are the facts resulting from their own :—

	Number of Lives.	Deaths.	Per Cent. of Probable Deaths.	Actual Rate of Mortality.	Probable Rate of Mortality.	Extra Premium to be charged.
Whole life	33,222	341	74	1.02	1.39	..
Endowment	83	0	0	0	1.60	..
Seven years	3,256	56	127	1.72	1.35	1.090
Other short terms	625	13	168	2.08	1.24	1.878
Whole Company	37,186	410	80	1.10	1.38	

The mortality in short term policies has been found in all cases inversely proportionate to the length of the term of the policy itself. If an extra premium corresponding to the real risks were put on, it would vary from 1 to 2 per cent., and in most cases bring up the premium to the rate charged for the whole of life; and, by a recent resolution, the Board have determined to decline undertaking such risks altogether.

I am not aware that any large collection of facts has been made in this country throwing light on this question. The general impression is, that as the benefit of selection is the greatest within a brief period after medical examinations, short term policies would be more profitable than others. Such policies, however, are more often effected by creditors or other parties having an interest in the lives assured, and who would probably run their own risk unless special circumstances made it peculiarly hazardous; or they may be made by parties on their own lives, who, from family circumstances or history, dangerous occupation or otherwise, wish to protect themselves at the cheapest rate against what they deem unusual but temporary danger to life. Such motives, and the advantage the assured always has against the Office in the secret knowledge of his own constitution, family history or circumstances, may be more than a set-off against the vigilance or skill of the medical examiner. At any rate, I hope that the question brought to issue by the facts recorded by the experience of the American Company, may have some light thrown upon it by the still larger experience recorded in this country.

The comparative mortality of the Company at different ages is

shown in the following table, carefully adjusted by Mr. Homans from the experience of the 15 years, which he has compared at each age with the Company's (or Mr. Gill's) theoretical table, and given also the expectations of life by both tables at every age. I give the adjusted table, as it is the most authentic and complete table yet deduced from American assured lives, and will allow of any combinations and comparisons.

Adjusted Table of Mortality, according to the Experience of the Mutual Life Insurance Company of New York, for Fifteen Years ending 1st February, 1858.

Age.	Number Living.	Number Dying.	Mortality per Cent.	Age.	Number Living.	Number Dying.	Mortality per Cent.
10	100,000	741	·741	55	65,208	1,086	1·666
11	99,259	739	·744	56	64,122	1,131	1·764
12	98,520	738	·749	57	62,991	1,185	1·881
13	97,782	737	·754	58	61,806	1,247	2·017
14	97,045	736	·758	59	60,559	1,317	2·175
15	96,309	735	·763	60	59,242	1,399	2·361
16	95,574	734	·768	61	57,843	1,485	2·568
17	94,840	733	·773	62	56,358	1,578	2·800
18	94,107	732	·778	63	54,780	1,675	3·057
19	93,375	731	·783	64	53,105	1,774	3·340
20	92,644	732	·790	65	51,331	1,878	3·659
21	91,912	732	·796	66	49,453	1,978	4·
22	91,180	733	·804	67	47,475	2,082	4·386
23	90,447	733	·811	68	45,393	2,193	4·831
24	89,714	734	·818	69	43,200	2,304	5·333
25	88,980	735	·826	70	40,896	2,427	5·935
26	88,245	735	·833	71	38,469	2,539	6·601
27	87,510	736	·841	72	35,930	2,623	7·299
28	86,774	737	·849	73	33,307	2,730	8·197
29	86,037	738	·857	74	30,577	2,705	8·847
30	85,299	738	·866	75			
31	84,561	739	·874	76			
32	83,822	739	·882	77			
33	83,083	740	·891	78			
34	82,343	740	·899	79	17,669	2,298	..
35	81,603	740	·907	80			
36	80,863	740	·915	81			
37	80,123	738	·921	82			
38	79,385	736	·927	83			
39	78,649	732	·931	84	7,732	1,466	..
40	77,917	726	·932	85			
41	77,191	721	·934	86			
42	76,470	717	·938	87			
43	75,753	719	·949	88			
44	75,034	729	·972	89	2,156	630	..
45	74,305	750	1·010	90			
46	73,555	784	1·066	91			
47	72,771	824	1·133	92			
48	71,947	867	1·205	93			
49	71,080	908	1·277	94	213	110	..
50	70,172	941	1·341	95			
51	69,231	966	1·395	96			
52	68,265	990	1·451	97			
53	67,275	1,018	1·513	98			
54	66,257	1,049	1·583	99	1	1	100·

In order to show the experience of the Company as to mortality under ages, the following table represents the proportion per cent. of actual to predicted deaths in decennial periods of age; and a comparison is made with the Mutual Benefit, of which Mr. Homans has computed the results from the table contained in their Report, and which I have given in a previous part of this paper.

Percentage Proportion of Actual to Predicted Deaths.

Ages.	15-25.	25-35.	35-45.	45-55.	55-65.	65-75.	All Ages.
Class I. alone	90	77	61	66	98	71	71
Classes I. and II. combined	90	86	65	67	95	83	74
Class II. (including VI.)	89	127	80	71	83	195	90
Class III. alone	662	85	96	90	99	0	96
Class IV. alone	595	215	156	79	44	122	136
Class V. (including VII.)	431	337	159	201	0	0	231
Whole Company	145	99	73	73	89	80	82
Whole Company (of Carlisle Table)	157	99	74	88	101	92	88
Mutual Benefit	191	101	80	84	72	103	88

In Class I. alone, or in Classes I. and II. combined, it will be noticed that the mortality in the Company is less than was expected at all ages—the middle period of life, from 35 to 55, being the most favourable; but in Classes IV. and V., comprising the southern States of the Gulf of Mexico and California, the mortality at the younger ages has been of an extraordinary character.

From the diagrams given in the original Report, the curves of the mortality in this Company can be compared with those in Mr. Gill's former table, with Farr's English Life, the Carlisle, and the Actuaries' Table. The most remarkable feature is the great comparative value of life in the former between the ages of 30 and 60. Below 30, and especially below 25, the value of life rapidly becomes less than was anticipated by previous observations. The excessive mortality at the younger ages, which is not only observable in this Company, but still more in the Mutual Benefit of New Jersey, may arise from the early period at which young men in the United States enter upon the cares and excitement and anxieties of active business—when the passions of youth are still in full play, and steadiness of habits, that may be presumed to follow more mature age, not yet rendered permanent. If the results in all classes and in both Societies were not so uniform, I should be disposed to allow that the number of lives at the younger ages was not sufficient for a fair comparison.

The curve of the Company's general experience approaches more nearly to the Actuaries' Table, the "Experience of Seventeen

English Companies," than any other. On examining the curve representing the number out of which one will die in each year in Classes I. and II. combined, Mr. Homans observed in his table what has been before noticed in some English tables, viz., that two points of maxima were shown at ages 27 and 42, and two of minima at ages 24 and 34. The value of life, or chance of living, increases from 24 to 27, then decreases to 34, and then rapidly increases to age 42, and as rapidly decreases to the close of life. Mr. Finlaison noticed the same peculiarity in his Government Male Annuity Table (1829), in which the point of greatest security of life was at age 13, decreasing to age 23, then increasing to age 34, then decreasing slowly to age 48, and then rapidly diminishing to the close of life. M. Quetelet has confirmed the same observation in Belgium, and Mr. Neison has shown the same result in his "Tables of Friendly Societies Experience," the maxima and minima varying according to the different occupations of the members. The Mutual Benefit of New Jersey shows also two points—ages 31 and 40 maxima, aged 21 and 36 minima. The causes of such anomalies are not very clearly understood, but they are well worthy the attention of the actuaries of Life Assurance Companies who have access to materials the most complete in form and the most accurate in facts that can be referred to for elucidation.

The comparison of the mortality in England with that of the Northern United States of America may be made by assuming the tables of Mr. Kennedy or Mr. Elliott, and those of Dr. Farr, as sufficiently correct for the purposes to which a census may be applied. But a still more accurate, and, to English Companies, more important comparison, may be made by comparing the results of their own experience with that of American Companies. Accordingly, the following table from Mr. Homans' Report shows the mortality per cent., in decennial periods of age, of the two American Companies, and of a table deduced by Mr. Homans from the census of the State of New York, taken in 1855, which, however, must be received with the usual allowance for the difficulties in procuring a perfect census.

Ages.	Exp. Seventeen English Companies.	Mutual Life of New York, Classes I. and II.	Fifteen Years, Whole Company.	Mutual Benefit, Twelve Years.	New York State Census, 1855.
15-25		·68	1·10	1·34	·80
25-35	·79	·62	·94	·97	·77
35-45	1·10	·81	·91	1·00	1·04
45-55	1·61	1·18	1·28	1·24	1·47
55-65	2·94	2·73	2·55	1·85	2·10
65-75	5·18	4·53	4·34	4·93	4·08

As compared with the English Assurance Companies, the two American Companies show a lower rate of mortality at all ages after 35, and at the middle periods of life to a very great extent; but below 35 the rate in both these Companies is not only unfavourable when compared with the English, but it very greatly exceeds the rate of mortality indicated in the table constructed from the New York census. This latter table, it gives us some surprise to find, exhibits at all ages a less rate of mortality than even English assured lives.

The conjecture of Mr. Gill, that the older lives would be found subject to a higher mortality than in England, does not seem justified by any of these tables.

In order to complete the comparison, the following table places in juxtaposition the expectation of life by the experience of the Mutual Life of New York, and of all the English Companies whose experience has been published, and also Elliott's Massachusetts Tables compared with Dr. Farr's English Life Table, No. 1.

Expectation of Life.

Age.	Mutual Life of New York, Fifteen Years.	Actuaries', or Seventeen English Companies'.	Equitable.	Economic.	Amicable.	Eagle.	Massachusetts, 1855. Elliott.	Farr's English, No. 1.
20	42·8	41·5	41·1	41·4	..	38·5	39·9	39·9
30	36·	34·4	34·	34·8	33·7	32·2	34·	33·1
40	28·9	27·3	27·4	27·2	25·9	25·7	27·9	26·6
50	21·6	20·2	20·8	20·	19·	19·4	21·3	20·
60	14·6	13·8	15·1	13·8	12·9	13·6	15·	13·6
70	8·6	8·5	9·8	9·2	8·1	8·6	9·4	8·5

The adjusted table of the Mutual Life Assurance Company of New York gives a higher expectation of life at all ages than their own theoretical table, and higher at all ages than any of the English tables, except the Equitable at 60 and upwards, and the Economic at 70. The Massachusetts Table also shows a higher expectation of life at all ages than Farr's English Tables. We should be prepared to wait for further confirmation in both classes of facts—for the former, on account of the recent selection of lives, and for the latter, on account of the probable defects in the registration of the census, which most American writers seem willing to admit is only gradually approaching perfection.

Still, there is nothing in the facts recorded with so much minuteness and accuracy, and reasoned upon with so much skill and ability, in the Report of Mr. Homans, but what is highly

favourable to the cause of life assurance. The rates, though imperfectly adjusted at the different ages to the actual risks ascertained both by the experience of his own Company and of the Mutual Benefit of New Jersey, are yet amply sufficient on the whole to afford large profits; and it would be unwise to alter them, till further observations, made in the same careful and elaborate manner, lead to decisive and final results.

Whether English Companies carrying on operations in America can expect equal success, is to me problematical. It is natural to suppose, that native Companies of such magnitude must have the choice of the business, and will obtain the largest share of profits. If few Companies of position and character existed there, the reputation of the English Companies for capital, enterprise, and honourable dealing might make them formidable competitors; but seeing the serious and unexpected losses which we have noticed in the early history of some of the classes of the great American Company here referred to, they should at least feel their way with equal caution, and record their experience with equal care.

In any case, we can congratulate the Americans on their energetic extension of this business. In the State of New York alone there were, in 1857, ten American Life Assurance Companies, which issued in that year 7,004 new policies, for assuring 20,478,857 dollars, or about £4,096,000 sterling; and had at risk, at the end of the year, 40,508 policies for 110,024,014 dollars, or about £22,005,000 sterling; whilst their receipts for the year amounted to 3,965,600 dollars, or £793,000. This is the more remarkable, as the oldest of these Companies, the one whose experience we have been considering, had not been in existence more than 15 years, and yet in 1857 its new business was 1,863 policies for assuring £1,170,000, and its policies in force at the end of the year 10,390, assuring £6,090,000 sterling.

When the census of the United States was taken in 1790, the population was found to be under 4,000,000; at the present time it is computed to be 30,000,000. In a nation striding to greatness with a rapidity so unexampled as this, we may be prepared for an equally rapid development of all those institutions which attend the advance of refinement and knowledge; and amongst them it cannot but be gratifying to notice the progress of those *with which* we are more especially concerned, and which have been proved by experience to be alike an evidence of civilisation, a benefit to the public, and an honour to the age and country in which they most prevail.